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ELEVEN NEW SPECIES AND THREE NEW GENERA OF OCEANIC FISHES COLLECTED BY THE INTERNATIONAL FISHERIES COMMISSION FROM THE NORTHEASTERN PACIFIC

By Wilbert McLeod Chapman

During the past 10 years the International Fisheries Commission has conducted extensive macroplankton work in the northeastern Pacific Ocean in their investigation of the early life history of the halibut. Incidental to the taking of eggs and young stages of halibut a wealth of other ichthyological material has been amassed, consisting of eggs, young stages, and adult specimens of a great many species of fishes. The present report is a study of the pelagic and bathypelagic fishes in the collection that are new to science.

I am indebted to Dr. W. F. Thompson, director of investigations, International Fisheries Commission, and director of the School of Fisheries, University of Washington, for permission to work on these fishes. Dr. L. P. Schultz, of the United States National Museum, gave much helpful advice. The work was done in the laboratories of the International Fisheries Commission and the School of Fisheries, University of Washington, while I was a student at the latter institution. Appreciation is expressed for the use of facilities of the two institutions. Tables giving the individual measurements and counts for each specimen reported upon are to be found in doctorate thesis no. 317884 in the University of Washington Library, Seattle, Wash. The holotypes and some of the paratypes of the new species are deposited in the United States National Museum. The other specimens are in the collection of the International Fisheries Commission, Seattle.

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LOCATION OF STATIONS

In the years 1926 to 1934, 2,246 net hauls were made at 1,161 stations in the northeastern Pacific by the International Fisheries Commission (hereafter referred to as the IFC). The area covered extends from off Cape Flattery, Wash., to the Sanak Islands, Alaska. It includes the coast of British Columbia and Alaska to the entrance of Bering Sea and extends throughout the Gulf of Alaska north of latitude 54° N.

Since the work was done to capture eggs and larvae of halibut, it covered principally only that time of year when they were to be expected in the plankton, that is, from January 1 to July 28. No stations were worked at any other time of the year. In the period January through March, stations were worked in 1928, 1929, 1930, 1932, 1933, and 1934. During this season the area around the Queen Charlotte Islands, especially in the vicinity of the Whaleback, Cape St. James, and the entrance to Hecate Strait was very well covered, as was also the northern part of the Gulf of Alaska from Yakutat to Cape Chiniak on Kodiak Island. No stations were worked west of that point. Stations were also worked farther out in the Gulf of Alaska, and a few off Cape Flattery, Wash. From April 1 to May 21, stations were worked in 1929, 1930, 1931, and 1932. The area around the Queen Charlotte Islands was again well covered. Many stations were worked across the Gulf of Alaska between latitudes 54° N. and 58° N. A few in the vicinity of Yakutat were the only ones worked in the northern part of the Gulf during this period. The area from Cape Chiniak to the Shumagin Islands was well covered. No stations were worked south of Queen Charlotte Sound. In the third period, between May 22 and June 27, stations were worked in 1931 and 1932. During this season no net stations were worked in the vicinity of the Queen Charlotte Islands or southward. Several lines of stations were run across the middle of the Gulf of Alaska to Kodiak Island. Another series was taken to the southwest of Kodiak Island, between it and the Alaskan Peninsula. A number of stations made in 1931, in the latter part of June and in July, were worked between Kodiak Island and the Sanak Islands.

The "standard" stations were made as follows: Three 1-meter nets were put on the wire at intervals of 300 meters. The wire was then played out until the bottom net was 900 meters from the boat. After being towed at slow speed for 20 minutes, 100 meters of wire were brought in. After another interval of 20 minutes the nets were raised another 100 meters. When the nets had been towed at these depths for another 20 minutes they were hauled to the surface. Their contents were removed and immediately preserved in 4 percent formalin. Thus the "A" nets were towed for 20 minutes at each of

100, 200, and 300 meters; the "B" nets at 400, 500, and 600 meters; and the "C" nets at 700, 800, and 900 meters. Collections at 344 of the stations were of this type. At times other nets were added below when the depth of the water permitted. At other times, when the boat was over shallower water, the bottom net, and sometimes also the "B" nets, were omitted. When towing over shallow water, the depth intervals of the nets were often altered to conform with the contour of the bottom. The time that they were towed at each depth was then nearly always one hour. Some vertical hauls were also made both with the regular open nets and with closing nets. This type of haul yielded very few fish.

All the "standard" hauls were made with 1-meter nets of the same type. These were nets, 1 meter in diameter at the mouth, made of silk 24 meshes to the inch in the cone and 14 to the inch in the cylinder. This type of net was used as the standard for the winter work because of the ease with which it could be handled in stormy weather and its relative efficiency. In smooth weather hauls were sometimes made with nets 2 meters in diameter at the mouth made of silk grit gauze, and Petersen Young fish trawls constructed out of quarter-inch mesh cotton netting. These latter were sometimes hauled at depths as great as 1,500 meters and caught many deep-sea fishes. Another type of net, the Danish trawl, was used extensively in 1931. It was a cone of "stramin" cloth hung on a hoop about 7 feet in diameter. It also yielded many fish.

DEPTH OF CAPTURE

Because of the fact that the hauls were made with open nets, it is not possible to determine accurately the depth at which any individual specimen was captured, for presumably the nets fished both on the way down and up. The bottom nets, therefore, had an opportunity to catch fish in the surface and intermediate levels as well as at the depths they were supposed to fish. This would not have been the case had closing nets worked satisfactorily. Unfortunately, the closing nets were unsuccessful as captors of adult fish. Furthermore, although a heavy weight was attached to the end of the wire, it did not hang straight down in the water. The IFC has used 85 percent of the length of wire out as an approximation of the depth at which the net was fishing. An effort was made to keep the cable at a constant angle, but in the stormy weather and strong tidal currents prevalent at times in the area covered it was impossible always to do so. It turned out, however, that an approximation could be made of the vertical distribution of several species because, although an individual would perhaps be caught during the short period of raising or lowering, it was safe to assume that numbers were taken only during the actual

horizontal haul. Some species were taken only in the "C" nets or in only the "C" and "B" nets, while others were captured only by "A" nets or "B" and "A" nets. The approximate vertical distribution of each species is discussed in the "Systematic Account."

It is interesting to note that many of the species are limited in their distribution to the open ocean where the water is 100 fathoms or more deep, even though they may be taken in the upper layers. Off the west coast of the Queen Charlotte Islands, especially in the vicinity of Cape St. James and the outer part of Queen Charlotte Sound, the bottom shelves off rapidly until only a few miles from shore it is over 1,500 fathoms deep. It was in this area that many of the most interesting fish were taken. This peculiarity of distribution cannot be attributed to the manner in which the hauls were distributed because as many or more stations were made over shallow water as were taken over deep water. Nevertheless, fish that were taken frequently in the shallow nets over deep water were never taken in nets hauled at the same levels over shallow water. They, therefore, must occupy normally a typically pelagic or bathypelagic habitat. This is discussed under each species in the text.

A complete description of each of the stations worked can be found in Report No. 9 of the International Fisheries Commission (Thompson and Van Cleve, 1936, table 16, pp. 134–160).

DEFINITIONS OF TERMS USED

In the descriptions of the luminescent organs of the Iniomi the terminology adopted by Parr (1928, pp. 50 and 51, fig. 6) has been used. The term "photophore" designates those circular or ovoid luminescent organs that appear in the regular series on the body, or the similar organs on the head in distinction to the other type of luminous organ, the so-called luminous scales and plates. The regular series of photophores on the body are defined as follows:

PLO=Suprapectoral organ, macula suprapectoralis, found usually between the base of the pectoral fin and the lateral line.

PVO=Subpectoral organs, maculae subpectoralis, between the base of the pectoral fin and the PO series.

PO=Thoracic organs, maculae pectoralis, along the ventral line between the isthmus and the base of the ventral.

VLO=Supraventral organ, macula supraventralis, between the base of the ventral fin and the lateral line.

VO=Ventral organs, maculae ventralis, between the base of the ventral fin and the first rays of the anal fin, on the ventral line.

SAO=Supra-anal organs, maculae supraanalis, between the anus and the lateral line.

AO=Anal organs, maculae analis, along the base of the anal fin, often divided by a distinct gap into two series, the antero-AO=antero-anal organs, maculae analis anteriores, and postero-AO=postero-anal organs, maculae analis posteriores.

POL=Posterolateral organ(s), macula(e) posterolateralis, between the lateral line and the gap between the two series of AO.

PRC=Praecaudal organs, maculae praecaudalis, along the base of the lower lobe of the caudal fin and along the posteroventral surface of the caudal peduncle.

The series of luminous scales along the dorsal and ventral side of the caudal peduncle in some of the fishes are called respectively the *supracaudal* and *infracaudal* series.

In treating the stomiatoid fishes the luminescent organs of the lateral, ventral, and caudal series have been described (after Parr, 1927, p. 23, fig. 19) as follows:

The upper, or lateral, series is divided into—

O–V=Photophores present between the gill opening and a perpendicular from the base of the ventral fin.

V–A=Photophores between the perpendicular from the base of the ventral and the beginning of the single caudal series (A–C).

The lower, or ventral, series is divided into—

I–P=Photophores anterior to the base of the pectoral fin.

P–V=Photophores between the bases of the pectoral and ventral fins.

V–A=Photophores from below the base of the ventral to the beginning of the single caudal series (the A–C).

The "length" in the descriptions is, unless specifically stated otherwise, the straight line from the tip of the snout to the bases of the middle rays of the caudal fins, the "length without caudal."

The "proportions of length" in the descriptions are the result of dividing the particular measurement of the body into the length without caudal.

SYSTEMATIC ACCOUNT

Order ISOSPONDYLI: Suborder SALMONOIDEI

Family BATHYLAGIDAE

Genus BATHYLAGUS Günther, 1878

BATHYLAGUS ALASCANUS, new species

FIGURE 58

Types.—The holotype, a specimen 83 mm long without caudal taken at station 444C, June 13, 1931, latitude 58°25′ N., longitude 146°04′ W., U.S.N.M. no. 108148, and 35 paratypes ranging from 27 to 81 mm in length without caudal taken at the following stations[1]: 4B; 6C; 12B; 21C; 184B; 189B; 218C; 234B; 236B; 256B; 258C; 267B; 290C; 293C; 303C; 324C; 326C; 336C; 338B; 384C; 391D; 407B; 447D.T.; 450C; 455D.T.; 456C; 457D.T.; 493D.T.; 495D.T.; 622C; 636C; 639C; 764B; 1116B.

[1] For data on stations listed in this paper see Report No. 9, International Fisheries Commission (Thompson and Van Cleve, 1936, table 16, pp. 134–160).

The paratypes in the United States National Museum bear the numbers 108151–108156.

Description.—(The proportions and counts of the holotype are given, followed by the ranges and averages of the paratypes in parentheses.) Dorsal rays 8 (7 to 9; 7.7); anal rays 24 (23 to 27; 24.3); caudal rays 51 (46 to 56; 50.8); pectoral rays 14 (13 to 14; 13.9); scales in lateral series 25 (23 to 27; 24.6). Proportions of the length without caudal: Length of head 3.4 (3.2 to 4.0; 3.59); snout to dorsal 1.8 (1.8 to 2.3; 2.01); snout to adipose 1.2 (1.1 to 1.3; 1.20); snout to pelvics 2.0 (1.9 to 2.4; 2.0); snout to anal 1.4 (1.3 to 1.6; 1.55); greatest depth 4.4 (4.2 to 6.2; 5.46); origin of dorsal to base of caudal 2.0 (1.6 to 2.1; 1.90); origin of anal to base of caudal 3.1 (2.5 to 3.1; 2.82); dorsal to adipose 2.9 (2.5 to 3.1; 2.82). Proportions of the length of head: Diameter of eye 2.6 (2.2 to 2.8; 2.59); length of upper jaw 6.2

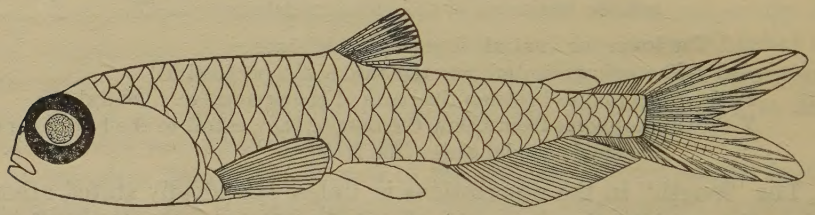

FIGURE 58.—*Bathylagus alascanus*, new species: Holotype (U.S.N.M. no. 108148), 83 mm long, from station 444C.

(3.2 to 6.7; 4.43); depth of caudal peduncle 4.4 (3.2 to 5.0; 4.16); interorbital space 3.7 (3.1 to 6.5; 4.34). Some of the proportions shown above vary considerably. Part of this variation is due to the changing of the body proportions during growth. The small number of specimens does not permit a statement of the degree of this change. Some part of this variation is due also to difficulties in measuring the soft small specimens accurately.

The body is completely clothed with large caducous scales. The eyes are large and circular, projecting slightly into the dorsal outline. The interorbital space is decidedly concave. The snout is short. The mouth is small. The maxillary reaches nearly to a vertical from the anterior edge of the lens of the eye. The teeth on the dentaries are small and sharp, in a single closely packed row. There are four moderately large teeth on the head of the vomer, and none on the shank or on the palatines, premaxillaries, maxillaries, or tongue. The lower jaw projects slightly. The origin of the dorsal fin is, in most specimens, a little ahead of the middle of the body. The adipose originates over the sixteenth or seventeenth ray of the anal, with the distal portion extending over the second or third caudal ray. The

free lobe is proportionately large. The pectorals are inserted low and have broad and nearly vertical bases. The rays reach a vertical from the ventral when depressed. The ventrals are inserted under the third or fourth ray of the dorsal. The caudal rays extend anteriorly along the caudal peduncle until there is only a slight space left between them and the adipose above and the anal below.

Remarks.—The only species in the genus with which this form could be confused is *Bathylagus milleri* Jordan and Gilbert (Jordan and Evermann, 1896–1900, p. 2825). In the original description of that species, based on a single badly mutilated specimen, the dorsal rays are given as 8 and the anal rays as 24, both of which are within the range of *B. alascanus*. However, it was stated that the origin of the dorsal is nearer the base of the caudal than the tip of the snout. Out of 28 specimens of *B. alascanus* 18 specimens have the origin of the dorsal nearer the tip of the snout than the base of the caudal, 6 have it equidistant between them, and 4 have the origin of the dorsal closer to the base of the caudal. It is also stated that in *B. milleri* "the interorbital space is converted into a very deep channel by two vertical thin lamellae which arise on either side and mark off the narrow interorbital space from the contiguous supraocular areas." In *B. alascanus* the interorbital is only moderately concave. In fact, in the smaller specimens, such as that from station 1116B, the interorbital space is flat, sloping forward. The concavity of the large specimens is caused by the expansion dorsally of the large eyes. In *B. milleri* the occipital region is swollen and prominent, much higher than the interorbital space. In *B. alascanus* the occiput is normal, and slopes gradually to the interorbital space. In view of these differences, the sketchy description of *B. milleri*, the badly mutilated condition of the type specimen of that species, and the striking differences of *B. alascanus* from the other species in the genus, it is described as new.

The locations of the stations at which this form was taken show a range for *B. alascanus* extending from off Cape St. James (southern tip of Queen Charlotte Islands) throughout the Gulf of Alaska to south of the Shumagin Islands. All the specimens except three were taken outside the 100-fathom line. These three, at stations 218C, 338B, and 407B, were taken on the edge of the 100-fathom line. None of the specimens taken in the standard hauls was taken in the "A" nets, 12 were taken in "B" nets, 17 were caught in the "C" nets. Only one specimen (from station 391D) was taken in a surface net. These data would indicate a bathypelagic habitat, outside the edge of the continental shelf, as normal for this species.

Named in reference to its habitat, the Gulf of Alaska.

MACROPINNIDAE, new family

Diagnosis.—Stomiatoid fishes with an adipose fin. The ventral fins are abdominal, situated on the side of the body above the ventral outline, and with very elongate rays, reaching to, or beyond, the base of the caudal. The anal fin is normal as long as or longer than the dorsal, and well separated from the caudal fin. The anus opens somewhat ahead of the origin of the anal. The ventral surface is normally rounded. There is no flat ventral "sole," with an anterior projection below the head. The eyes are cylindrical, pointing directly upward. They are covered with dense black pigment laterally and anteriorly so that vision can be only vertical. The maxillaries are present, broadly expanded posteriorly. The gape is minute. The opercle is small and ovoid, with its longest diameter only a little more than its shortest. It does not project below the level of the pectoral base. The subopercle is only a little smaller than the opercle and is of the same general shape. The body is short and stubby; the head is large. There are no luminous spots on the body or head. There is no mental barbel.

This family of peculiar fishes appears to be somewhat related to the Opisthoproctidae, which are found in the eastern Atlantic (Vaillant, 1888; Zugmeyer, 1911a and b; and Roule and Angel, 1933); the western Atlantic (Gregory, 1933); and the western Pacific in the South China Sea (Trewavas, 1933). No fish remotely resembling the present species has been described from the eastern Pacific. From the Opisthoproctidae they differ strikingly in the presence of a maxillary (absent in the Opisthoproctidae), which is broadly expanded posteriorly; by the perfectly normal anal fin, which is larger than the dorsal, and the normally placed anus (in the Opisthoproctidae the anus opens posteriorly near the base of the caudal fin; the anal fin is normally atrophied, and is either very small and only slightly separated from the caudal or is so closely appressed to the latter that it appears to be absent); by the differences in the size and shape of the opercle and subopercle (the Opisthoproctidae have the opercle long and narrow; the subopercle is very small and is almost hidden by the preopercle); by the lack of a ventral "sole" (this peculiar structure, characteristic of the Opisthoproctidae, consists of a flattened ventral surface which projects more or less beyond the normal outline under the head and is supported by the anterior arm of the cleithrum); by the position and extreme length of the ventral and pectoral fins (in the Opisthoproctidae the ventral fins project into the ventral outline and are of normal length); and by numerous other peculiarities (see Trewavas, 1933). The Macropinnidae, however, resemble the Opisthoproctidae in the small gape, the general shape of the body, the presence of an adipose fin, and the dorsally directed eyes.

MACROPINNA, new genus

Genotype.—Macropinna microstoma, new species.

The characters of the genus are those of the species.

MACROPINNA MICROSTOMA, new species

FIGURE 59

Types.—The holotype, a specimen 39.5 mm long from station 621C, collected March 28, 1932, latitude 53°50′ N., longitude 134°20′ W., U. S. N. M. no. 108143, and 27 paratypes from the following stations: 7B; 25C; 122A; 132A; 132B; 192; 207A; 245C; 260C; 268B; 293B; 334C; 339A; 396A; 407C; 410A; 412A; 434A; 491D.T.; 546D.T.; 593B; 621C; 626B; 627B; 817A; 953C; 1017C; 1113A.

Those paratypes in the United States National Museum bear numbers 108177–108185.

Description.—Twenty-eight specimens of this species are in the IFC collection, ranging in length without caudal from 6.5 to 39.5 mm. The specimen from station 621C is taken as the holotype, with the other 27 as paratypes. Its counts and bodily proportions follow: Dorsal ray 11; anal rays 14; caudal rays 40; pectoral rays 17; ventral rays 10; number of scales in the lateral line 24. Length without caudal 39.5 mm. Proportions of the length without caudal: Length of the head 2.0; snout to dorsal origin 1.4; snout to adipose 1.1; snout to insertion of ventrals 1.3; snout to origin of anal 1.4; greatest depth 2.7. Proportions of the length of the head: Diameter of eye 2.8; length of upper jaw 5.6; least depth of caudal peduncle 3.9; length of caudal peduncle 3.9.

A second adult specimen from IFC station 407C had the following counts and proportions: Dorsal rays 11; anal rays 14; caudal rays 10; pectoral rays 18; ventral rays 10; scales along the lateral line 26. Length without caudal 27.5 mm. Proportions of the length without caudal: Length of the head 2.1; snout to dorsal origin 1.4; snout to adipose 1.1; snout to insertion of ventrals 1.8; snout to origin of anal 1.4; greatest depth 3.2. Proportions of the length of the head: Diameter of eye 2.6; length of the upper jaw 4.3; least depth of caudal peduncle 3.7; length of caudal peduncle 3.7.

The body is deep and short, quite unlike the slender form of the smaller specimens. It appears to have been completely covered by large cycloid scales, although only those along the lateral line remain on the holotype. The snout is broad, flat, and shovellike. It is U-shaped in dorsal aspect. The eyes are not round, but are cylindrical, with the pupils pointing directly upward so that the cornea projects into the dorsal outline. They are completely surrounded laterally by a densely pigmented area. Dorsoanteriorly this light

shield bears a dorsal projection which cuts off the light coming from ahead. The region of the head immediately anterior to the eyes is transparent, except for a slight amount of pigment around the openings of the nostrils, which are placed here. The adductor mandibularis, the eye muscles, and the ramifications of the cranial nerves are plainly visible.

The gape is extremely small, not reaching more than a third of the way to the eye. No teeth can be seen on any of the bones of the mouth, although there may be a few minute teeth on the premaxillaries and the dentaries. The specimens remained in formalin until the osseous structures became flabby. The maxillary is short but greatly expanded posteriorly so that it is nearly as broad as it is long.

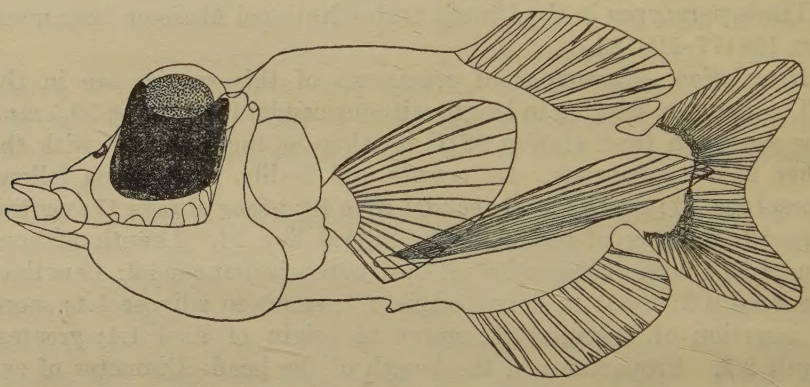

FIGURE 59.—*Macropinna microstoma*, new genus and species: Holotype (U.S.N.M. no. 108143), 39.5 mm long, from station 621C.

The dentary is even more expanded posteriorly than the maxillary. This expanded portion fits in under the maxillary, between that bone and the palatine.

The opercle is oval, with the longest diameter vertical. It is a proportionately small bone. It does not extend below the base of the pectoral fin. The subopercle is a small oval bone about the size of the opercle. The dorsal arm of the preopercle is normal, but the ventral arm is enormously expanded ventrally and is the largest bone in the opercular series. The interopercle is also large and expanded ventrally. It is mostly overlain by the preopercle. It does not reach to the subopercle. The four branchiostegal rays are broad and very thin. The gill rakers are short, broad, triangular, and thin; the gill membranes are broadly united and attached to the isthmus with a broad free fold behind.

The dorsal and anal fins are similar to each other; the former is inserted a little ahead of the latter. The adipose is situated on the caudal peduncle about midway between the end of the dorsal and the first rays of the caudal. The pectoral fins are large and are situated

well up on the body, about midway between the dorsal and ventral outlines. Their rays are fine and long, reaching to the middle of the anal fin. The ventrals are likewise placed high on the body and well forward so that they are only a short way ventral and posterior to the pectoral fins. They are inserted far ahead of the origin of the dorsal. Their rays are moderately stout near their bases and extremely long, reaching beyond the posterior end of the body. Although the caudal fin is frayed, it can be seen that it is distinctly divided into a dorsal and a ventral lobe. The anus opens far ahead of the origin of the anal fin, only a short distance posterior to a vertical from the bases of the ventral fins.

6.5-MILLIMETER STAGE

The specimen from station 817A is the smallest one in the collection. It is 6.5 mm in total length. Unfortunately, like most of the smaller specimens, it is so badly twisted that measurements cannot be accurately made. The head is contained in the total length 2.9 times. The eyes are torn from the sockets, and it is not possible to see how much they point dorsally. There is a small spot of pigment at the nape. Along the posterior half of the dorsal midline there is a row of 14 small pigment spots arranged segmentally. A similar line of pigment extends from the sixth segment behind the vent to the base of the caudal fin. There is a small amount of pigment around the posterior half of the abdomen. The lateral bars of pigment so characteristic of the later postlarval stages are completely absent. The large head, the long flat snout, and the tiny mouth are similar to the same structures in the older specimens. The number of body segments (35), together with the former characters, makes the identification of this peculiar fish easy even at such a small size. The notocord projects almost straight back from the body. The caudal rays are just beginning to form along its lower side. There is no trace of the dorsal, adipose, pectoral, ventral, or anal fins.

12-MILLIMETER STAGE (FIG. 60)

The specimen from station 953C is 12 mm in length without caudal. The head is contained in the length 3.7 times; the greatest depth of the body 6; and the snout to the insertion of the ventrals 2.3. The specimen is long and slender, quite unlike the adult in this character. The characteristic large head with the long flat snout and tiny mouth are present. The eyes at this stage point nearly vertically and are surrounded laterally by black pigment. There is a fine line of pigment extending backward along the ventral side of the head from each corner of the lower jaw. A similar, but median, line of pigment lies along the ventral midline below the heart and the anterior portion of the alimentary tract. The pigment along the dorsal and ventral

midlines of the posterior half of the fish, found in the smaller specimen, is not present on individuals of this length. There is a round, brownish blotch of pigment at the base of each of the ventral fins which extends above the middle of the body. A similar but lighter patch is found at the base of the caudal fin, covering two-thirds of the base. On each segment, except the first two anterior ones, there is a characteristic short bar of pigment below the lateral line. Posteriorly these bars fade and merge into each other. The similar bars found above the lateral line in the larger specimens are not found in fish of this size, although there is a slight indication of them. The pectoral fins are well formed; the rays are formed but are short and do not extend to the base of the ventrals. The ventral rays are also formed

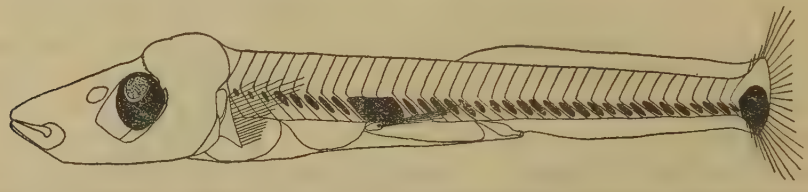

FIGURE 60.—*Macropinna microstoma*, new genus and species: Specimen 12 mm long, from station 953C.

but are likewise short and reach only to the anus. Most of the caudal rays are formed and the hypural plate is present. There is no indication of the dorsal, anal, or adipose fins, although there is a moderately large fin fold extending from the vent to the base of the caudal fin and another along the dorsal side from the caudal to above the insertion of the ventrals. The anus is inserted at about two-fifths of the way from the base of the ventrals to the caudal. The intestine extends from the third pigment bar ahead of the base of the ventral, where it emerges from the right side of the stomach, in a straight line to the sixth pigment bar behind the base of the ventrals. At this point the intestine becomes constricted and there is a dextral flexure. The intestine then widens out to form the rectum, and the anus lies below a vertical from between the ninth and tenth pigment bars behind the base of the ventrals.

16.5 MILLIMETER STAGE (FIG. 61)

The specimen from station 593B, 16.5 mm in length without caudal, has the typically slender body of the postlarval stages but differs somewhat from the 12 mm specimen. The body is somewhat deeper throughout than that of the latter. The head, snout, mouth, and eyes are the same. The lines of pigment extending back from the corners of the lower jaws are still present. The blotch of pigment at the base of the ventrals is constricted so that it lies over the abdominal cavity but does not extend up on the side of the body beyond the

insertion of the ventrals. The caudal pigment blotch extends completely across the base of the caudal fin. In addition to the segmentally arranged bars of pigment that are found below the lateral line on the smaller specimen there is a similar series above the lateral line that is prominent anteriorly but fades out before the origin of the dorsal. The rays of the pectoral are larger and extend beyond the base of the ventrals. The ventral rays are also much longer than those in the smaller specimen. They extend to the end of the anal fin. The dorsal and anal fins are both present, although their rays are not yet fully developed. The origin of the adipose fin can barely be made out in the median fin fold remaining between the dorsal and the caudal. The ventral median fin fold has disappeared. The large

FIGURE 61.—*Macropinna microstoma*, new genus and species: Specimen 16.5 mm long, from station 593B.

rays of the caudal approach the form of the older specimens but the small rays dorsally and ventrally have not yet become differentiated. The intestine still originates from the right side of the stomach, but the pylorus has turned dorsally so that the intestine makes a half turn around the stomach. The posterior dextral flexure of the large intestine still lies under the sixth pigment bar behind the ventral base, but the small intestine has coiled back nearly to the level of the ventral origin. It has likewise lengthened. The anus has, in the meantime, moved forward until it lies under the eighth pigment bar behind the ventral origin and only a short distance posterior to the intestinal flexure.

Length without caudal 16.5 mm. Proportions in length without caudal: Length of head 2.8; greatest depth 5.1; snout to origin of the dorsal 1.4; snout to insertion of ventrals 2.1; snout to origin of anal 1.4. Proportions in the length of the head: Length of upper jaw, 4.0; diameter of eye 4.8; length of caudal peduncle 4.0; depth of caudal peduncle 3.4. There are 37 segments in the body.

25-MILLIMETER STAGE

The specimen from station 293B, 25 mm in length without caudal, has practically attained the adult form and characters but is important in that it still retains some of the larval characteristics. The segmentally arranged pigment bars below and above the lateral line, although faded, are still present. The peritoneum has become heavily

pigmented. Three small spots remain of the blotch of pigment that covered the base of the caudal in the smaller specimens. The body is otherwise without pigment. Although the digestive organs have become enlarged so that the depth of the body anteriorly approaches that of the adult form, the enlargements of the bases of the dorsal and anal fin remain transparent so that this fish appears to have the characteristic slender body of the smaller specimens. Whereas in the case of the 12 mm specimen the pectoral and ventral fins were well separated and the rays of the pectoral did not reach to the base of the ventrals, in this specimen the base of the ventrals lies only a short distance behind the bases of pectorals and the rays of the pectoral, when depressed, extend nearly to the base of the anal. The rays of the ventrals have become even more elongate and reach to the first rays of the caudal fin. Although the flexures of the intestine are obscured by the dense pigment of the peritoneum, it is apparent that the anus has moved farther anteriorly until it lies anteriorly to the posterior flexure of the intestine. It is considerably nearer a vertical from the base of the ventral than the origin of the anal. The scales have not yet formed.

Length without caudal 25 mm. Proportions of the length without caudal: Length of head 2.3; snout to origin of dorsal 1.3; snout to the adipose 1.0; snout to insertion of the pelvics 1.7; snout to the origin of the anal 1.3; greatest depth 3.4. Proportions of the length of the head: Diameter of eye 3.1; length of upper jaw 3.7; depth of caudal peduncle 3.7; length of caudal peduncle 3.1. There are 37 segments in the body.

Remarks.—Several characters are remarkably changed during the development of this species. The intestine coils and the anus moves anteriorly nearer to the level of the origin of the ventrals. The bases of the ventrals move forward nearer to the bases of the pectoral. The growth downward of the abdominal cavity also makes the bases of the ventrals appear to move higher on the body. The depth of the body and the bulk of the head increase so considerably that the general shape of the adult fish little resembles that of the long slim postlarvae. The rays of the pectoral and the ventral, especially the latter, become greatly elongate. The adipose is the last of the fins to appear.

This peculiar species of fish appears to be somewhat related to the species of the genus *Opisthoproctus* of the family Opisthoproctidae, which are found in the eastern Atlantic (Vaillant, 1888; Zugmayer, 1911a and 1911b; and Roule and Angel, 1933); the western Atlantic (Gregory, 1933); and the western Pacific in the South China Sea (Trewavas, 1933). No fish remotely resembling the present species has been described from the eastern Pacific. From the species of *Opisthoproctus* this species differs strikingly in the presence of a

maxillary (absent in *Opisthoproctus*), which is broadly expanded posteriorly; by the perfectly normal anal fin, which is larger than the dorsal, and the normally placed anus (in *Opisthoproctus* the anus opens posteriorly near the base of the caudal fin; the anal fin is normally atrophied and is either very small and only slightly separated from the caudal, or is so closely appressed to the latter that it appears to be absent); by the differences in the size and shape of the opercle and subopercle (*Opisthoproctus* has the opercle long and narrow; the subopercle is very small and is almost hidden by the preopercle); by the lack of a ventral sole (this peculiar structure, characteristic of *Opisthoproctus*, consists of a flattened ventral surface which projects more or less beyond the normal outline under the head and is supported by the anterior arms of the cleithra); by the position and extreme length of the ventral and pectoral fins (in *Opisthoproctus* the ventral fins project into the ventral outline and are of normal length); and by numerous other peculiarities (see Trewavas, 1933). The new genus and species resembles *Opisthoproctus* in the small gape, the general shape of the body, the presence of an adipose fin, and the dorsally directed eyes.

Named in reference to the elongate pectoral and ventral fins and the tiny mouth.

Family MELANOSTOMIATIDAE

PHOTONECTOPS, new genus

Genotype.—Photonectops multipunctata, new species.

Stomiatoid fishes having the general characters of the Melanostomiatidae as defined by Parr (1927). Vertical fins confined to the tail; dorsal and anal fins beginning at the same vertical and covered with only normal fin membrane. Pectoral fins absent. Pelvic fins close together and inserted well behind the middle of the body. Vertebrae 82 as counted by Dr. Schultz and Mr. Reid of the National Museum from an X-ray of the type made through the courtesy of officials of the U. S. Naval Hospital.

Mouth noticeably curved upward so that the symphysis of the lower jaw projects beyond the snout when the mouth is closed. Teeth in lower jaw very numerous with some fanglike; arranged in many oblique rows. Teeth on maxillary also arranged in several rows. Premaxillary teeth stout and recurved, not depressible. Two rows of large depressible fangs on the "tongue." Teeth present on the palatines but not on the vomer.

Snout rather reduced; not protractile or movable. Normal membranous floor between lower jaws. Lateral photophores well developed and very numerous. A large suborbital organ posteriorly; a smaller anteroventral luminescent organ on the border of the eye; and a similar small organ on the anterodorsal margin of the eye.

Photonectops is probably most closely related to *Photonectes* from which it is differentiated by the more numerous photophores in the lateral series, the more numerous teeth, which are arranged in several rows, by the absence of pectoral fins (present in some species of *Photonectes*), and by more than one suborbital organ on each side of head. From *Melanostomias* and *Echiostoma* it is differentiated by the more numerous teeth, the more numerous photophores, the elongate slender shape, and the cleft of the mouth being long and strongly curved upward anteriorly. From *Echiostoma* it differs further in having no pectoral fins. From *Lamprotoxus*, *Grammatostomias*, and *Opostomias* it differs by the more posterior insertion of the ventrals. From *Eustomias* and *Flagellostomias* it is distinguished by the anal and dorsal fins beginning at the same vertical. From *Photostomias* and *Malacosteus* it is separated by the presence of a barbel and the presence of a normal floor between the lower jaws. From *Pachystomias* it is told by the presence of teeth on the maxillaries and the normal floor between the lower jaws. From *Aristostomias* it is differentiated by the normal floor between the lower jaws, the strongly curved jaws, and lack of pectorals.

Other characters of the genus are those of the species.

PHOTONECTOPS MULTIPUNCTATA, new species

FIGURE 62

Types.—Holotype, a specimen 280 mm in standard length from station 1256C taken January 3, 1935, latitude 51°15′ N., longitude 131°37′ W., U.S.N.M. no. 108144, and one paratype from station 665C, April 14, 1932, latitude 51°16′ N., longitude 130°35′ W., U.S.N.M. no. 108160.

Description.—The species is described from two specimens. The holotype is in good condition except for the loss of some skin on the dorsal surface, the sides, and the caudal region and fraying of the fins. The barbel is reduced to a short black stub. It is not possible to determine whether this is the natural state or whether the organ has been broken off. Except for the broken tips of the fin rays the smaller paratype (from station 665C) also is in excellent condition.

The proportions and counts for the holotype are: Dorsal rays 16; anal rays 19; pelvic fins 10 rays on the left side and 9 on the right. Length without caudal 280 mm. Proportions of the length without caudal: Snout to insertion of the ventrals 1.5; snout to insertion of anal 1.1; greatest depth (before ventrals) 14.8; depth behind head 21.5; diameter of eye 56.0; length of lower jaw 11.7; length of snout 46.6; length of longest ventral ray 7.6. The large, nearly circular, luminous spot behind and below the eye is covered by dark pigment; the smaller one on the anteroventral border of the eye, noted in the

smaller specimen, is here reduced to a small spot. Above the latter, on the anterodorsal margin of the eye, is a third small luminescent spot of crescentic shape. Scattered over the body and head are a myriad of small glandular bodies. Between each pair of branchiostegal rays is a photophore of the same type as those in the lateral and ventral rows. The two rows of photophores along the lower half of the body, typical of the fishes of this relationship, are present here. In the lateral series there are 46 photophores between the operculum and the base of the ventral fin (O–V) and 20 between the base of the ventral and the beginning of the caudal series (V–A). In the ventral series there are 57 photophores between the isthmus and the base of the

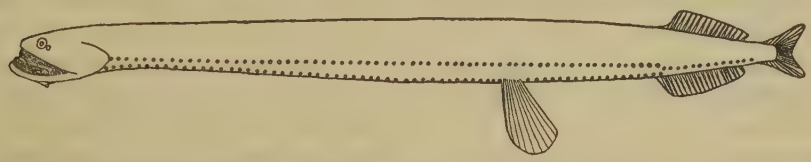

FIGURE 62.—*Photonectops multipunctata*, new genus and species: Holotype (U.S.N.M. no. 108144), 280 mm long, from station 1256C.

ventral (I–VO) and 21 between the base of the ventral and the beginning of the caudal series (V–A).

Because of loss of skin, the caudal series can not be counted accurately on the large specimen.

In the lower jaw there are about 85 teeth varying in size from minute denticles to moderate-sized fangs. Near the symphysis there are 2 teeth, behind these a group of 3 teeth, and posterior to this there is a patch of 4 teeth. Posterior to this last group, and separated from it by a short interspace, the remaining teeth are arranged in 11 oblique, parallel rows, which have 5 to 7 teeth in each. The teeth on the anteroexternal end of the rows are minute denticles. The others graduate in size to the large fangs on the posterointerior end of the row. The teeth in the rows become smaller toward the corner of the jaw. In the upper jaw there are 21 teeth of assorted sizes. Eight of these are on the palatine, 4 on the premaxillary, and the remaining 9 are arranged in 3 oblique rows on the maxillary. There are no teeth on the vomer. The teeth on the two palatines are separated by a median bare space anteriorly. The 4 teeth on the premaxillary are stout and recurved, differing from all the other large teeth in the mouth by not being depressible. They are up on the side of the jaw and do not enter into the gape. There are two rows of large depressible fangs on the "tongue," each consisting of 6 teeth. The first three pairs are based on the glossohyal and are separated by a small interspace from the last three pairs, which are apparently borne by the first basibranchial. The mouth is noticeably curved upward,

and the heavy symphysis of the lower jaws projects beyond the snout when the mouth is closed.

The eye is large, being only a little less in diameter than the length of the snout. The interorbital space is wide and convex. The lower jaws are connected by a full membrane, which is attached to the tip of the isthmus. There are 13 branchiostegal rays. The barbel is a little nearer the isthmus than the symphysis. It is a short, stout, jet-black stub, which, as mentioned above, may be natural or may be only the remainder of a mutilated organ. As it is, it does not show in the ventral outline but is entirely contained in the concavity between the two jaws.

The body is jet-black over all. Much of the thin epidermis was rubbed off in removing the fish from the net, although great care was taken to avoid such mutilation. This exposed a lead-gray dermis. The form of the body is elongate and terete. It is most compressed and deepest ahead of the insertion of the ventrals. There are no pectoral fins. The pelvic fins are inserted well behind the middle of the body and near the ventral outline. The base is broad; the rays are stout. Although many of the rays have been broken off, the four which are intact are long (7.6 in length without caudal) and taper to fine filaments. The anal and dorsal originate on the same vertical and are both covered only by a normal membrane. The caudal is small and deeply notched.

The much smaller paratype differs in some respects from the above description. It has 14 dorsal rays, 19 anal rays, and the ventral on both sides contains only 8 rays. The caudal has 25 rays, 3 short fine rays above, 4 long thick rays forming the upper lobe of the fin, 11 shorter, much more delicate rays forming the fork of the tail, 4 more long stout rays forming the lower lobe, followed by 3 rays on the ventral side of the fin similar to those on the dorsal side. The length without caudal is 99 mm. Proportions of the length without caudal: Snout to ventrals 1.5; snout to anal 1.2; depth ahead of ventral insertion 19.8; depth behind head 22.0; diameter of eye 33.0; length of the lower jaw 9.2; length of snout 38.2; the longest ventral ray 14.1.

The anterior two-thirds of the circular postorbital luminous spot shows as a typical white patch; the posterior one-third is covered by pigment. The spot on the anteroventral margin of the eye is more distinct than that in the holotype. There is no luminous spot on the anterior dorsal margin of the eye. Owing to the lighter color of the epidermis the myriad tiny glandular dots over the body and head are more apparent than they are on the larger specimen. They each consist of a white dot surrounded by black pigment. They are not arranged in any definite pattern except upon the lower jaw, where there is a straight, closely crowded row extending back along the

ventral surface from the symphysis, and around the eye, where a row completely encircles that organ. In the lateral series there are 45 photophores in the O-V series and 18 in the V-A series. In the ventral row there are 57 organs in the I-V series and 19 in the V-A series. In the caudal series there are 13 photophores. There are 14 photophores in the branchiostegal series, and 13 branchiostegal rays.

The body is slenderer than that of the larger specimen. It is black along the abdominal region, but not densely jet-black as in the holotype. The rest of the body and the head are a rich brown. The barbel is 4 mm long, and is completely contained in the depression between the lower jaws. Its base is stout and it tapers to a fine point. It is rather simple, devoid of luminous bulbs or tendrils, and does not appear to have been broken.

There are only 45 teeth on the lower jaw. These are arranged similarly to those in the holotype except that there are only 9 oblique rows posteriorly and each of these rows contains only 4 or 5 teeth. On the upper jaw there are about 30 teeth arranged like those on the larger specimen. The rows on the "tongue" have 7 teeth in each, the additional pair being inserted upon the basihyals.

Remarks.—Both of these specimens were taken off the west coast of British Columbia. The depth of their capture indicates that they are probably similar to the other Gymnophotodermi in being confined to a truly bathypelagic habitat.

Named in reference to the numerous photophores in the lateral and ventral series.

Order INIOMI

Family SUDIDAE

Genus SUDIS Rafinesque, 1810

SUDIS SQUAMOSA, new species

FIGURE 63

Holotype.—A specimen 85 mm without caudal, from station 734B, taken May 10, 1932, latitude 56°55′ N., longitude 156°11′ W., U.S.N.M. no. 108150, is clearly referable to the genus *Sudis* but differs from any other species described in that genus.

Description.—Dorsal rays 12; anal rays 21; caudal rays 41; pectoral rays 20; ventral rays 10; branchiostegal rays 9; gill rakers 9+30 on the first arch. Proportions of length without caudal: Length of head 3.9; snout to dorsal 1.8; snout to adipose 1.2; snout to pelvics 1.8; snout to anal 1.4; greatest depth 7.7; diameter of eye 14.2; length of snout 12.1; length of upper jaw 8.5; interorbital space 21.2; depth of caudal peduncle 17.0; length of caudal peduncle 12.1; length of pectorals 8.5; length of ventrals 7.7; length of dorsal base

7.7; length of anal base 6.1; dorsal origin to base of middle rays of caudal 2.3; anal origin to base of caudal 3.9; length of adipose fin base 10.6.

The body is covered everywhere with minute scales that can scarcely be made out without the help of a lens. The head is naked and bears no pronounced ridges. The snout is conical and pointed, only slightly longer than the diameter of the large round eye. The premaxillary reaches to a vertical from the middle of the eye and excludes the maxillary from the upper jaw. The lower jaw projects slightly. The premaxillary is completely toothed along its lower edge with a single row of small, conical teeth. The dentary is similarly toothed on its anterior two-thirds. The symphyseal knob is toothed and projects into a toothless cavity at the junction of the premaxillaries when the mouth is closed. The vomer has a single row of minute conical teeth on the anterior edge of the head of the bone; there are no teeth on the shank. The palatines have an irregular row of minute teeth along nearly the whole length of each bone, which is double on the anterior half of the bone and single posteriorly. The entire dorsal surface is covered with small, widely spaced teeth. The gill membranes are not united and are not attached to the isthmus. The gill rakers are long and slender.

The dorsal fin is high and short and is inserted nearer to the tail than to the snout. The adipose fin originates over the middle of the anal. Its base is long; the fin is low and fimbriated. Neither the tip of the adipose nor the rays of the anal, when depressed, reach to the rudimentary rays of the caudal. The pectoral fins are inserted very low, with the bases oblique and quite broad. The fin is the same length as the upper jaw. The pelvic fins originate under the second dorsal ray. Their rays are heavier and thicker than those of the pectorals, and the fins are slightly longer than the latter. The anal fin is long and moderately low and is inserted far back on the body so that the distance from the anal origin to the base of the middle rays of the caudal is the same length as the head, or 3.9 in the length without caudal. The caudal fin is forked, with rudimentary rays dorsally and ventrally, short weak rays in its middle and longer, stout rays forming the dorsal and ventral lobes. The anus opens directly before the anal fin.

Remarks.—Two other species of this genus, *Sudis ringens* and *S. coruscans*, have been described from the west coast of the United States by Jordan and Gilbert (1881a and 1881b), the former from southern California and the latter from the Straits of Juan de Fuca. From both of these the present species can be easily distinguished. In *Sudis squamosa* the greatest depth is contained in the length without caudal 7.8, the length of the head 3.9, the snout to anal 1.3; the upper jaw is contained in the head 2.2, the length of the caudal peduncle 3.1;

FIGURE 63.—*Sudis squamosa*, new species: Holotype (U.S.N.M. no. 108150), 85 mm long, from station 734B.

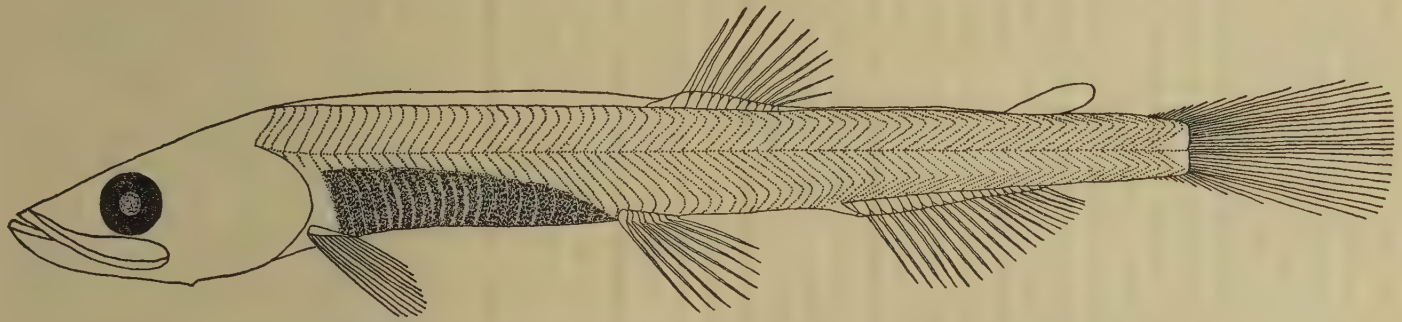

FIGURE 64.—*Lestidium* (*Bathysudis*) *parri*, new species: Holotype (U.S.N.M. no. 108140), 57 mm long, from station 118B.

there are no canine or fanglike teeth on the tongue, dentaries, or palatines, the gill rakers are long and slender; the vent is in its normal position before the anal fin, far behind the bases of the pelvics; there are 12 rays in the dorsal, 21 in the anal, and 20 in the pectorals; the scales are very minute; and the ventrals are inserted under the second ray of the dorsal. *Sudis ringens* (according to Jordan and Gilbert, 1881a, p. 273) has the depth contained in the length 16.0 times, the head 6.1 times, and the snout to the anal 1.25 times; the upper jaw is contained in the head less than 2 times, the length of the caudal peduncle 2.7 times; there are canine teeth on the dentaries and palatines; there are no teeth on the tongue; the gill rakers are short, sharp, spinelike; there are 11 rays in the dorsal, 26 in the anal; the scales are very large. In *Sudis coruscans* (Jordan and Gilbert, 1881b, pp. 411–412) the depth is contained in the length 13 times; teeth not fanglike; the gill rakers are broader than they are long; the vent is slightly behind the base of the ventral fins; dorsal rays 8, anal rays 31; pectoral rays 9; scales small with those of the lateral line large, nonimbricated and platelike; the ventrals are inserted completely behind the base of the dorsal. These differences, among many others, show the present species to be widely different from these two. It appears to be more similar to *Lestidium* (*Bathysudis*) *speciosum*, from which, however, it can be told by the presence of scales, the more anterior insertion of the ventral, and other characters (according to the description and figure of Parr, 1928, pp. 42–43 and fig. 4) *Sudis ringens* has been synonymized with *Sudis rissoi kroyeri* by Parr (1928).

Named in reference to the squamation.

Genus LESTIDIUM Gilbert, 1905

LESTIDIUM (BATHYSUDIS) PARRI, new species

FIGURE 64

Types.—Holotype, a specimen 57 mm in length without caudal, from station 118B, taken February 12, 1929, latitude 59°45′ N., longitude 147°00′ W., U.S.N.M. no. 108140, and 3 paratypes from station 120, taken February 13, 1929, latitude 59°49′ N., longitude 144°50′ W., in the IFC collection.

Description.—(In this paragraph the measurements and counts are given for the holotype followed by the range of the paratypes in parentheses.) Dorsal ray 11 (11 to 13); anal rays 20 (20 to 22); caudal rays 43 (41 to 45); pectoral rays 11 (11); pelvic rays 8 (8); gill rakers on first arch 5+18 (5+17 to 5+18). Proportions of length without caudal: Length of head 4.0 (3.8 to 3.9); snout to dorsal 1.8 (1.8); snout to adipose 1.2 (1.2); snout to pelvic 2.0 (1.8 to 2.0); snout to anal 1.4 (1.4); greatest depth 8.1 (7.1 to 7.2); diameter of eye 19.0 (14.3 to 18.0); length of snout 14.2 (14.3 to 16.7); length of

upper jaw 8.1 (7.1 to 7.2); interorbital space 16.3 (15.4 to 16.7); depth of caudal peduncle 16.3 (15.4 to 16.7); length of caudal peduncle 8.1 (8.3 to 9.0); length of pectorals 8.1 (8.3 to 9.0); length of pelvics 8.1 (8.3 to 9.0); length of dorsal base 9.5 (9.0 to 9.1); length of anal base 5.7 (5.4 to 5.6).

The body and head are moderately compressed, the latter deeper than wide. There are no scales on the bodies of any of the specimens. All the fish, however, are obviously juveniles and the scales have perhaps not yet developed. There is a lateral line present. The length of the snout is the same or only slightly greater than the diameter of the eye. The eyes are moderately large and are placed laterally. The interorbital space is broad and is only slightly convex. The nostrils lie midway between the tip of the snout and the eyes. The premaxillary extends to or beyond a vertical from the posterior margin of the eye.

The lower jaw projects, the symphyseal knob is slightly elevated, toothed, and fits into a toothless concavity at the junction of the premaxillaries. There is a single row of relatively large, recurved teeth on the premaxillaries that becomes smaller posteriorly. The teeth hook over the outside of the dentaries when the mouth is closed. The teeth on the dentaries form an irregular single series, some of the anterior of which project out slightly to meet those of the premaxillaries. The vomer bears a line of 4 or 5 large teeth on the head and one on the shank. The palatines have an irregular series of teeth running nearly the length of the bone; some of these are considerably larger than the others. The tongue is free anteriorly and bears 5 or 6 large canine teeth upon its dorsal surface. The largest of these is in a median position anteriorly. Behind it there is a row of either 2 or 3 similar teeth on each side that are spaced rather widely. Extending posteriorly along the basihyals and basibranchials is a double row in which the teeth are smaller and more closely set than those on the tongue. The maxillaries are large and long, extending along three-quarters or more of the length of the premaxillaries. The gill rakers are long and slender. The pseudobranchiae are well developed.

The dorsal fin is high and short. The adipose is inserted above the posterior third of the anal. It is moderately high and has a distinct lobe projecting freely behind. The pectoral fins are small and have weak rays. They are placed very low on the body, nearly in the ventral outline. The pelvics are likewise placed low, a little behind the middle of the body, yet in front of the origin of the dorsal. Their rays are stouter than those of the pectorals. The anal originates well behind the dorsal and contains nearly twice as many rays as the latter. The tail, measured from the origin of the anal to the base of the middle rays of the caudal, is less than one-third the length of the body.

The dorsal third of the body is liberally sprinkled with brown punctulations. The base of the anal bears 4 or 5 larger pigment spots. There are a few pigment spots on the caudal peduncle. A ring of small pigment spots nearly encircles the eyes, and the snout and anterior dorsal surface of the head likewise bear chromatophores. At the symphysis of the dentaries there are a few spots which extend nearly half the distance down each dentary. The rest of the body is without dark pigment except along the ventral midline between the pectoral and pelvic fins where the body musculature is not complete and the blue-black peritoneum is exposed.

Remarks.—This species is most closely related to *Lestidium* (*Bathysudis*) *speciosum*. It differs from that species by the presence of teeth on the vomer, the characteristic dentition of the tongue and pharynx, and the fact that the upper jaw extends to or beyond a vertical from the posterior edge of the eye.

The subgenus *Bathysudis*, which Parr (1928) has introduced for *L. speciosum* and to which the present species clearly belongs, should probably be recognized as a separate genus. The comparatively short and rounded body, the short conical snout, and the wide gape extending to or beyond the anterior edge of the eye mark these two species from the rest of the genus *Lestidium*, for the tendency in that genus is toward a long snout with the maxillary not reaching to the eye and toward a long slender body with a comparatively short tail.

All the specimens were taken in moderately shallow water, the deepest net having only 170 meters of wire out. Both stations were taken in the northern part of the Gulf of Alaska, station 118B near the mouth of Prince Williams Sound, and station 120 near Cape St. Elias.

Named for Dr. A. E. Parr, in honor of his extensive work with deep-sea fishes.

Family MYCTOPHIDAE

Genus MYCTOPHUM Rafinesque, 1810

MYCTOPHUM OCULEUM, new species

FIGURE 65

Types.—Holotype, a specimen 42 mm without caudal, from station 533D.T., taken July 3, 1931, latitude 54° 15′ N., longitude 158° 23′ W., U.S.N.M. No. 108146, and 37 paratypes from the following stations: 11B; 25B; 34B; 106B; 167C; 171C; 172B; 184A; 189A; 209B; 256A; 256C; 266B; 282C; 284C; 306B; 307B; 317B; 322C; 333C; 340B; 344B; 350; 365; 373; 382; 386?; 389C; 426C; 451D.T.; 452B; 453D.T.; 528D.T.

The paratypes in the United States National Museum bear the numbers 108158 and 108159.

Description.—(The measurements and counts of the holotype are given followed by the range and average of the paratypes in parentheses.) Dorsal rays 13 (11 to 13; 11.7); anal rays 25 (22 to 25; 23.5); pectoral rays 16 (15 to 16; 15.1); pelvic rays 8 (8); scales in lateral line 38 (35 to 39; 36.9); number of AO 17 (15 to 18; 16.0). Proportions of the length without caudal: Length of head 2.9 (2.6 to 3.1; 2.90); snout to dorsal 2.1 (1.7 to 2.1; 1.93); snout to adipose 1.3 (1.2 to 1.4; 1.29); snout to pelvics 2.4 (2.0 to 2.4; 2.25); snout to anal 1.7 (1.6 to 1.9; 1.75); greatest depth 3.5 (3.0 to 3.9; 3.38). Proportions of the length of head: Diameter of eye 2.5 (2.0 to 2.8; 2.35); length of upper jaw 1.5 (1.2 to 1.6; 1.40); length of caudal peduncle 2.5 (1.8 to 3.4;

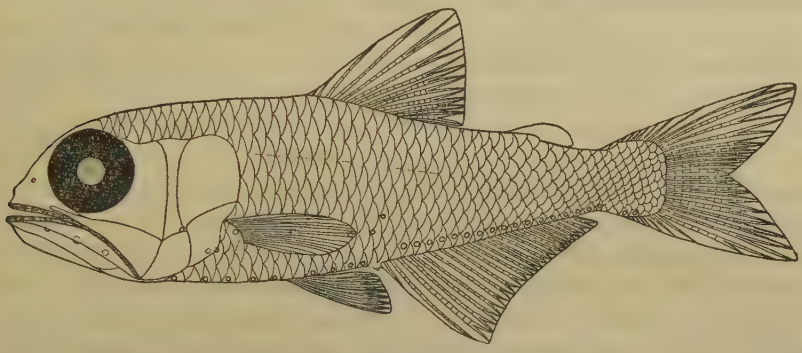

FIGURE 65.—*Myctophum oculeum*, new species: Holotype (U.S.N.M. no. 108146), 42 mm long, from station 533D.T.

2.49); depths of caudal peduncle 3.8 (2.7 to 4.0; 3.45); length of pectoral fins 1.9 (1.4 to 2.0; 1.69); length of pelvic fins 2.1 (1.5 to 2.1; 1.96).

The body is compressed, short, and deep. The scales are cycloid and caducous. Those of the lateral line are greatly broadened. The eyes are large but normal; the lenses are only slightly elliptical and are not noticeably turned upward. The anterior profile is more rounded than common in the genus. The premaxillaries have each a band of small villiform teeth along the entire edge, even on the lateral portion of the bone. The dentaries are toothed in a similar fashion. The vomer has a small round patch of teeth at each of the two anterolateral corners of the head of the bone, but none between or on the shank. The palatine has a small patch of teeth lying closely behind the patches on the head of the vomer, a short bare space, and then a small band of teeth extending ventroposteriorly to the end of the bone. The maxillary is expanded posteriorly, forming a broad triangle; the square-cut posterior edge reaches beyond a perpendicular from the posterior margin of the eye. The gill rakers are long and slender and bear a row of toothlike processes on the inner edge of each.

The dorsal is short and high, its longest ray (the fourth) reaches past the end of the fin base to the origin of the adipose. The adipose lies over the posterior fourth of the anal fin; its free portion is slightly longer than its base. The pectorals are inserted moderately high on the body and are good sized. Their rays reach beyond the anterior SAO and nearly to the insertion of the anus. The pelvics are inserted on the ventral contour of the body a little nearer the insertion of the pectorals than the origin of the anal. Their longest rays extend past the anus to the third or fourth ray of the anal fin. The anal is long and moderately high, its longest ray (the third) when depressed reaches two-thirds of the length of the base of the fin; it originates under the posterior third of the dorsal.

There are the usual three photophores on the under jaw, the small one at the end of the premaxillary, and the larger one directly above on the angle of the preopercle. The PLO is well below the base of the pectoral fin, on a level with the most anterior and ventral of the two PVO and is nearly hidden by the edge of the subopercle. The ventral PVO lies a third of the way along a straight line from the dorsal PVO to the most anterior of the PO series. There are 5 PO, all of which are on the same level; but the last three are closer together than the first two. The VLO is about midway between, and forms a straight line with the dorsal PVO and the most anterior SAO. There are 4 VO all on the same level. The middle one of the 3 SAO is about one-third of the distance from the posterior one and lowered enough so that the three form a wide anteriorly facing angle. The AO are in a single series that is well separated from the PRC. All the photophores are on the same level. There are 2 PRC; the posterior one is slightly more dorsal than the anterior one. Luminescent scales are found above or below the caudal peduncle on the larger specimens, but not in both places on the same specimen. There are no antorbital or suborbital luminescent organs; no photophores above the lateral line; and no POL.

Remarks.—Myctophum oculeum is most closely related to that group of species of the genus that have no photophores above the lateral line, no POL, with the AO in one single continuous series, and with the PLO at or below the base of the pectoral fin. This group consists of *M. parallelum*, *M. arcticum*, *M. rissoi*, *M. anderssoni*, *M. antarcticum*, and *M. subasperum*. In the following sentences, the characters given for these species are taken from Parr (1928) unless otherwise noted. From *M. parallelum* this species is differentiated by the first two SAO and the two PRC not being separated by conspicuously wider interspaces as in the former; the head is included 2.6 to 3.1 in the length without caudal instead of 4.0; the AO are generally less than 18 (in only one specimen out of 38 are there 18 AO) while in *M. parallelum* the AO are 18; the eyes are not telescopic, and the lens

is never more than slightly excentric. *M. oculeum* is separated from *M. arcticum* by its eyes being normal and the lens not being markedly excentric; by having the dorsal rays 11 to 13 instead of 9 as in the latter (according to Goode and Bean, 1895); and by having 22 to 25 anal rays instead of 17 (op. cit.). This species differs from *M. rissoi* by having the eye 2 or more in the head instead of 2 or less; by having the PLO on a level with the lower PVO instead of above the dorsal one as shown by Goode and Bean, 1895, for the latter; and by having 15 to 16 AO instead of 11 (op. cit.). From *M. anderssoni*, *M. oculeum* can be told by the longer head (2.6 to 3.1 in *M. oculeum*, 3½ in *M. anderssoni*); and by the two anterior AO not being elevated as in *M. anderssoni*. *M. oculeum* is distinguished from *M. antarcticum* as described by Goode and Bean, 1895 (under the name of *Myctophum colletti*), by having 11 or 12 dorsal rays instead of 15; by having more than 21 anal rays, and 15 instead of 13 pectoral rays. *M. subasperum* has the origin of the anal at the vertical from the end of the base of the dorsal fin and has ctenoid scales, whereas *M. oculeum* has the anal originating under the posterior third of the dorsal fin and has cycloid scales. Furthermore, *M. parallelum*, *M. arcticum*, *M. rissoi*, and *M. anderssoni* have never been taken in the Pacific, according to Parr (1928). *M. antarcticum* is found only in Antarctic waters. Although *M. subasperum* has been taken in the Pacific, it has never been taken in the northeastern section of that ocean. *M. oculeum* represents the first record of a species of this interesting group from the Pacific coast of North America.

The present range of *M. oculeum* extends from off the coast of Washington through British Columbia waters and the Gulf of Alaska to off Kodiak Island. It has been taken only in waters outside the 100-fathom line.

Named in reference to the large and peculiar eyes.

Genus LAMPANYCTUS Bonaparte, 1840

LAMPANYCTUS MICROPUNCTATUS, new species

FIGURE 66

Types.—Holotype, a specimen 77 mm in length without caudal, from station 622C, taken March 28, 1932, latitude 53°40′ N., longitude 134°15′ N., U.S.N.M. no. 108142, and 19 paratypes from the following stations: 167A; 183C; 189B; 319A; 338B; 621C; 633C; 699C; 752A; 765B; 976C; 1014B; 1020B; 1110C; 1118C; 1120C; 1143A.

Those paratypes in the United States National Museum bear the numbers 108161–108167.

One of the two specimens from station 338B was too desiccated to use in the measurements.

Description.—(In this paragraph the proportions and counts of the holotype are outside the parentheses and those of the paratypes in the parentheses.) Dorsal rays 15 (14 to 16); anal rays 18 (17 to 19); caudal rays 36 (33 to 38); pectoral rays 15 (14 to 15); pelvic rays 8 (8); scales in a lateral series 36 (36 to 39); AO 7+8 (6 to 8+7 to 8); supracaudal luminous scales 4 (3 to 5). Infracaudal luminous scales 7 (5 to 8). Proportions of the length without caudal: Length of the head 3.7 (1.3 to 3.8); snout to dorsal 2.1 (1.9 to 2.1); snout to adipose 1.3 (1.3 to 1.4); snout to ventrals 2.5 (2.1 to 2.5); snout to anal 1.8 (1.7 to 1.9); greatest depth 5.4 (5.0 to 5.9); length of caudal peduncle 4.7 (4.0 to 5.0). Proportions of the length of head: Diameter of eye

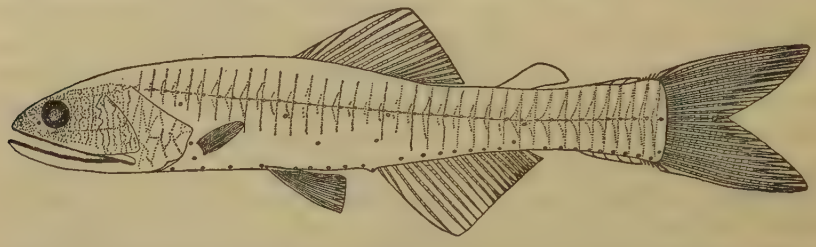

FIGURE 66.—*Lampanyctus micropunctatus*, new species: Paratype, 85 mm long, from station 183C.

5.4 (5.4 to 6.5); length of snout 4.7 (3.4 to 5.4); length of upper jaw 1.4 (1.1 to 1.4); depth of caudal peduncle 2.8 (2.7 to 3.8).

The adipose fin is inserted over the last four rays of the anal. The pectorals are inserted below the angle of the opercle. The base is narrow; the rays are fine and filamentous, the middle ones reaching beyond the bases of the ventrals. The ventrals are placed well ahead of the origin of the dorsal. The anal originates under the third or fourth from the last dorsal ray.

All the photophores on the head and body are very small, those on the head being especially degenerate. The antorbital is marked only by a small bit of black pigment on the anterior edge of the orbit on a level with the center of the eye. The customary row of photophores under the mandible is only faintly visible through the covering skin. The photophore at the angle of the jaw is a tiny dot; the one on the operculum directly above it, and a little above a horizontal line through the upper pectoral rays, is larger but is only faintly seen through the skin. There are no photophores on the cheek or on the shoulder. The PLO is high, situated about one-fourth the distance from the lateral line to the base of the pectoral, and only a little posterior to a line through the PVO and the second PO. The upper PVO is level with the dorsal pectoral rays; the second lies halfway from the upper PVO on a line from that organ to the second PO. There are four PO, all lying on the same level. The first lies under the edge of the branchios-

tegal membrane and is farther from the second than the second is from the third; the second, third, and fourth are separated by approximately equal interspaces. The VLO is about the same distance from the lateral line to the base of the ventrals. There are four or five VO, all on the same level and separated by nearly equal intervals. The SAO form an angle of about 100°. The upper one is separated from the lateral line by a distance only slightly greater than its small diameter; the second is halfway along a straight line between the upper SAO and the most posterior VO; the third is far forward, nearer to a perpendicular through the second VO than one through the third, and it is slightly below the level of the second SAO. The AO are in two distinct series 6–8 + 7–8. Where the PRC are confluent with the posterior series of AO they have been counted as four, in accordance with the method of Parr (1928, p. 77). The remainder of the series has been counted as AO posteriores. The first AO anterior is a little below the level of the rest of the series; the others are all on the same level. There are two POL the dorsal one touching the lateral line and lying over the interspace between the two series of AO; the ventral one in on a line between the dorsal POL and the last photophore of the anterior AO series, nearer to the latter than to the former. There are four PRC. The ventral three are close together and lie in a gentle arc curving upward from the level of the AO. The dorsal PRC is separated from the ventral three by a wide interspace and lies directly on the end of the lateral line. The PRC are usually separated from the AO posteriores but in some specimens on one or both sides the two series are confluent. There are luminescent scales both supra- and infra-caudally on all specimens. The supracaudal series (3 to 5 scales) is always shorter than the infracaudal series (5 to 8 scales). While these luminescent scales are not so well defined as in the species of *Myctophum*, their boundaries can be made out in each case. There are no other such luminescent scales on any other part of the body or head. There are no photophores above the lateral line.

Remarks.—Lampanyctus micropunctatus does not appear to be especially close to any other species in the genus. If the phrase "PRC distinctly separate from AO" be eliminated from A, I in Parr's key (Parr, 1928, p. 78) this species will fit into the group containing *L. nicholsi*, *L. braueri*, *L. maderensis*, *L. townsendi*, and *L. warmingi*. It should be included under a separate division C, under A, I. This division C should read "Only four PRC. Four PO." The character "four PO" will serve to separate this species from those listed in the group above.

Lampanyctus micropunctatus has been taken off Queen Charlotte Sound, off the west coast of the Queen Charlotte Islands, off Prince of Wales Island, off Portlock Bank, and off Albatross Bank. "Off" is necessary in the above phrases because it has been on each occasion

taken outside the 100-fathom line. No specimens have been taken at the stations between the one near Prince of Wales Island and the one near Portlock Bank.

Named in reference to the tiny photophores.

Family SCOPELARCHIDAE

NEOSCOPELARCHOIDES, new genus

Genotype.—Neoscopelarchoides dentatus, new species.

The characters of the genus are those of the species.

This genus is most closely related to the genera *Scopelarchus* and *Scopelarchoides*. It differs from both in the proportionately slender and longer body, in the lack of differentiation of the teeth on the glossohyal, in the much longer caudal peduncle, and in the fact that the ventrals are inserted ahead of the dorsal. From *Scopelarchus* it is further differentiated by having the pectoral fin shorter, smaller, and with much weaker rays than the stout pelvic fins. It can be separated from *Scopelarchoides* by the normal musculature of its abdominal walls which contrasts so strongly with the peculiar and apparently characteristic abdominal musculature of the latter (see Parr, 1929 and 1931). In common with this genus, however, it has weak pectoral fins and very stout ventral fins.

Neoscopelarchoides can be separated from the genus *Benthalbella* by the fact that the former has teeth on the vomer and palatine while the latter does not. From *Promacheon* the new genus differs in the absence of enlarged teeth of any kind on the premaxillary, in contrast to the striking dentition on the premaxillary of the former (see Weber, 1913, and Weber and Beaufort, 1913).

NEOSCOPELARCHOIDES DENTATUS, new species

FIGURE 67

Types.—Holotype, a specimen 162 mm in length without caudal, from station 102C, taken January 29, 1929, latitude 56°22′ N., longitude 145° 54′ W., U.S.N.M. no. 108145, and 12 paratypes ranging in length without caudal from 42 to 97 mm, taken at the following stations: 172C; 220C; 237B; 333C; 337B; 389B; 633B; 1028B; 1110C; 1117B; 1134C.

Those paratypes in the United States National Museum bear numbers 108168–108176.

Description.—(In the following description the count or proportion of the holotype is given, followed by the range and average of the specimens in parentheses.) Dorsal rays 7 (6 to 7; 6.9); anal rays 20 (17 to 21; 18.9); caudal rays 45 (43 to 46; 44.9); pectoral rays 23 (22 to 25; 23.5); pelvic rays 9 (9); scales in a lateral series 56 (56 to 58;

56.9); branchiostegal rays 9 (8 to 9; 8.9). Proportions of length without caudal: Length of head 4.9 (4.7 to 5.5; 5.15); snout to dorsal 2.5 (2.4 to 2.6; 2.52); snout to adipose 1.2 (1.2); snout to pelvics 3.0 (2.6 to 3.0; 2.72); snout to anal 1.6 (1.5 to 1.6; 1.55); greatest depth 8.1 (7.5 to 9.2; 8.10); length of caudal peduncle 4.3 (4.2 to 5.0; 4.73); dorsal origin to base of middle caudal rays 1.6 (1.6 to 1.7; 1.65); anal origin to base of the middle caudal rays 2.8 (2.8 to 2.9; 2.83). Proportions of length of head: Diameter of eye 3.7 (2.7 to 4.0; 3.26); length of snout 3.3 (2.4 to 3.3; 2.76); length of upper jaw 1.4 (1.3 to 1.6; 1.40); interorbital space 26.9 (6.7 to 26.9; 10.83); depth of caudal peduncle 3.9 (3.9 to 4.6; 4.20).

The body is long, slender, and moderately compressed. It is completely covered with scales. In the specimens less than 74 mm in

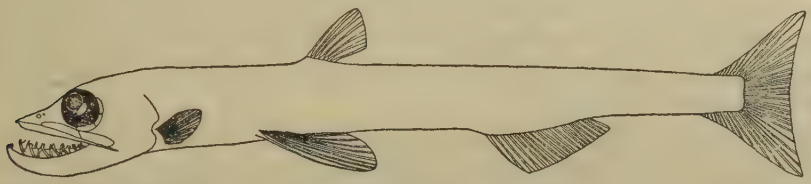

FIGURE 67.—*Neoscopelarchoides dentatus*, new genus and species: Holotype (U.S.N.M. no. 108145), 162 mm long, from station 102C.

length the scales have not yet formed. The scales along the lateral line are considerably enlarged. The small specimens (less than 74 mm in length without caudal) all have a characteristically translucent abdominal cavity. If the fish is held toward a light, the shape of its visceral organs can be plainly seen. The head is moderately compressed and is scaleless. The nostrils are a little nearer the snout than the eyes. The eyes, even in the small specimens, are distinctly telescopic. They look dorsally and anteriorly. Around their ventral two-thirds they are encased in black pigment. Below and behind the lens, but on the eyeball, is an oval patch of pearly white material, similar in appearance to the luminescent patches found on the genus *Diaphus*. There are no other luminescent bodies on the fish. The eyes are separated by only a very narrow interorbital space. In the smaller specimens the interorbital space is proportionately much wider than in the larger specimens because of the fact that a specimen 42 to 43 long has an interorbital space of the same width as one 162 mm long. The lower jaw extends far behind the eye, almost to a vertical from the upper end of the opercle.

The bones of the mouth bear a surprising array of teeth. There are (in the holotype) 10 teeth in a single series on the glossohyal. The most anterior one of these arises ventrally to the bases of the others, on the very tip of the tongue. It is about twice as long as the others and more recurved. The remaining nine are short and stout, not

especially enlarged and not barbed or hooked. They are not compressed. They bear no resemblance to the peculiar glossohyal teeth of the *Scopelarchus anale* as depicted by Parr (1929, fig. 4). Along the full length of the premaxillary is a single series of minute recurved teeth. These are so small that on the anterior two-thirds of the bone they do not project through the skin. The teeth on the dentary are similar to those shown by Parr (1929, fig. 2) for *Scopelarchus anale*. On the holotype and the larger paratypes the teeth at the symphysis are much reduced. On the palatine there is a double row of teeth. The anterior three in the inside row are enlarged and have the same shape as the fangs on the dentary. The other teeth grow progressively smaller posteriorly. Exterior to and slightly anterior to each of the teeth in this row, except the anterior fang, there is a smaller tooth. These form the incomplete second row. There is a small stout tooth on the outer angle of each side of the vomer. The teeth on the dentary and palatine are depressible. Those on the glossohyal and the vomer are not.

The dorsal is inserted nearer to the insertion of the pectorals than the origin of the anal. The fin is short; the rays are slight. The pectoral fins are small and have fine rays. They are inserted obliquely just above the articulation of the lower jaw and the quadrate, with the upper ray midway between the ventral outline and the lateral line. The pelvic fins are inserted slightly ahead of the dorsal fin. Their rays are stout and broad; the fins are much longer and larger than the pectorals. The anal is moderately long and high. The caudal fin is long and distinctly forked. It consists of 11 or 12 short rays extending along the dorsal side of the caudal peduncle, 22 stout rays forming the fin proper, and 11 to 13 short rays running along the ventral edge of the caudal peduncle. The caudal peduncle is as long as or longer than the length of the head.

Remarks.—This species is evidently distributed widely in the Gulf of Alaska. The holotype was taken in the middle of the Gulf, about 200 miles south of Cape St. Elias, the nearest land. The longest paratype was captured southeast of Kodiak Island. The rest of the paratypes were captured along the outer coast of southeastern Alaska and British Columbia from the latitude of Cape Scott on Vancouver Island to midway between Salisbury Sound and Cape Cross on Chichagof Island. All the specimens were taken outside the 100-fathom line over deep water. None of the specimens was taken in the upper ("A") nets, 6 were taken in the middle ("B") nets, and 7 were captured by the lower ("C") nets. This indicates that the species lives in a bathypelagic habitat.

This species is differentiated from the other fishes of this relationship under the discussion of the new genus. It is named in reference to its striking dentition.

Order XENOBERYCES

Family MELAMPHAIDAE

Genus MELAMPHAES Günther, 1864

MELAMPHAES CAVERNOSUS, new species

FIGURE 68

Types.—Holotype, a specimen 70 mm in length without caudal, from station 824C, taken June 8, 1932, latitude 56°06′ N., longitude 152°09′ W., U.S.N.M. no. 108147, and 3 paratypes, ranging in length from 56 to 70 mm from station 429D, U.S.N.M. no. 108157, and station 1119C.

Description.—(In the following description, the proportions and counts of the holotype are given, followed by range of the specimens in parentheses.) Dorsal rays III–16 (15 to 16); anal rays I–8 (8 to 9); caudal rays IV–19–III (III to V–19–III); pectoral rays 16 (15 to 16); pelvic rays I–7 (I–7); scales in a lateral series 29 (29 to 31); gill rakers on lower part of anterior arch 15 (15 to 16). Proportions of the length without caudal: Length of the head 2.7 (2.7 to 2.8); snout to dorsal 2.3 (2.3 to 2.4); snout to pelvic insertion 2.3 (2.3 to 2.4); snout to anal 1.5 (1.5); greatest depth 3.2 (3.2 to 3.4); length of pectoral fins 3.2 (3.2 to 3.3); length of pelvics 4.7 (4.3 to 5.4); length of caudal peduncle 3.7 (3.7 to 3.9); base of dorsal 3.9 (3.3 to 4.0). Proportions of the length of the head: Diameter of eye 6.2 (6.2 to 7.1); length of snout 3.7 (3.6 to 4.3); length of upper jaw 2.4 (2.1 to 2.5); length of pectoral fins 1.2 (1.1 to 1.2); length of pelvics 1.7 (1.5 to 1.9); depth of head 1.2 (1.2 to 1.3); depth at pectoral insertion 1.2 (1.1 to 1.2); depth of caudal peduncle 3.2 (3.1 to 3.3); interorbital space 2.0 (2.0 to 2.4); base of dorsal 1.4 (1.2 to 1.4); base of anal 4.3 (3.6 to 4.3). Depth of caudal peduncle divided into the length of caudal peduncle 2.6 (2.3 to 2.6).

The cavernous head does not bear prominent ridges or spines. The mouth is distinctly oblique. The maxillary ends under the middle of the eye. No rostral spine is present. There are teeth in bands on both jaws. The preopercle is armed with two weakly developed spines at its lower angle. The opercle is scaled. Pseudobranchiae are present. The pelvic fins are inserted slightly ahead of the pectorals. The anal fin originates under the last or next to last dorsal ray.

Remarks.—This species is closely related to *Melamphaes macrocephalus*, *M. microps*, and *M. lugubris*. From *M. macrocephalus* [2] it is differentiated by the lack of a rostral spine; by the smaller head (2.7 to 2.8 in length without caudal in *M. cavernosus*, 2.0 to 2.3 in

[2] Measurements taken from Parr, 1931.

M. macrocephalus); the wider interorbital space (2.0 to 2.4 in *M. cavernosus*, 2.6 to 3.0 in *M. macrocephalus*); and by the shorter maxillary (ending below the middle of the eye in *M. cavernosus* and beyond a vertical from the posterior margin of the eye in *M. macrocephalus*).

From *M. microps* [3] this species is separated by the deeper body (3.2 to 3.4 in length without caudal from *M. cavernosus*, 4.75 to 5.0 in *M. microps*); the wider interorbital space (2.0 to 2.4 in head in *M. cavernosus*, 3.0 to 3.25 in *M. microps*); the shorter maxillary (ending under the middle of the eye in *M. cavernosus*, under or beyond the

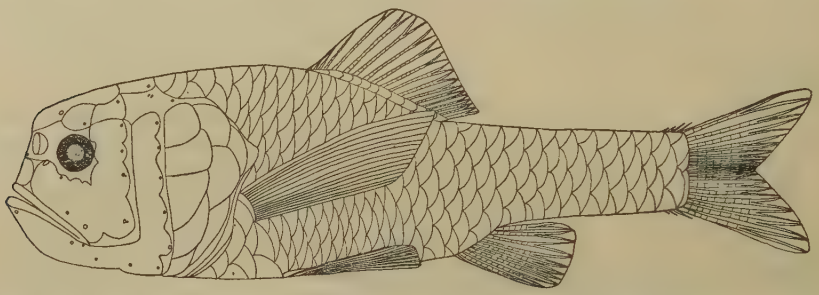

FIGURE 68.—*Melamphaes cavernosus*, new species: Holotype (U.S.N.M. no. 108147), 70 mm long, from station 824C.

posterior margin of the eye in *M. microps*); more rays in the pectoral (15 to 16 in *M. cavernosus*, 14 in *M. microps*); longer caudal peduncle (3.7 to 3.9 in length without caudal in *M. cavernosus*, 4.25 to 4.5 in *M. microps*). From the subspecies *M. microps longivelis*, described by Parr (1933), this species is easily told by the longer caudal peduncle (3.7 to 3.9 in length without caudal in *M. cavernosus*, about 5.0 in the other).

This species is distinguished from *M. lugubris* [3] by the greater number of scales in a longitudinal series (29 to 31 in *M. cavernosus*, 26 to 27 in *M. lugubris*); by the wider interorbital space (2.0 to 2.4 in head in *M. cavernosus*, 3.0 in *M. lugubris*); shorter maxillary (ending under middle of eye in *M. cavernosus* ending below posterior border of eye in *M. lugubris*); wider pectoral fin (16 rays in *M. cavernosus*, 14 ? in *M. lugubris*); longer caudal peduncle (3.7 to 3.9 in length without caudal in *M. cavernosus*, 5.0 in *M. lugubris*); and in the position of the origin of the pelvics (behind the insertion of the pectorals in *M. cavernosus*, ahead in *M. lugubris*).

The portion of the key to the species of this genus, published by Norman (1929) and added to by Parr (1931 and 1933), dealing with the above species should be modified as follows in order to accommodate this new species:

[3] Measurements from Norman, 1929.

x. Head 2⅔ to 3⅛ in the length without caudal; origin of pelvic a little behind or below pectoral base; eye 5 to 6¾ in head; depth 3½ to 4 in length; interorbital width 3 to 3¼ in head---**M. microps**

xx. Head 2⁷⁄₁₀ to 2¾ in length without caudal; origin of pelvic a little behind pectoral base; eye 6⅛ to 7⁷⁄₁₀ in head; depth 3.2 to 3.4 in length; interorbital width 2 to 2.4 in head------**M. cavernosus**

xxx. Head 2½ in the length without caudal; origin of pelvic a little in front of pectoral base; eye 6 to 6½ in head; depth 3½ to 4 in the length; interorbital width 3 in head----------**M. lugubris**

xxxx. Head 2 to 2⅓ in length without caudal; origin of pelvic a little in front of pectoral base; eye 8⅜ to 9⅜ in head; depth 3⅓ in length; interorbital width 2⅔ to 3 in head----------**M. macrocephalus**

Named in reference to the cavernous nature of the bones of the head.

MELAMPHAES RUGOSUS, new species

FIGURE 69

Holotype.—A specimen 94 mm in length without caudal, from station 453D.T., taken June 16, 1931, latitude 55°32′ N., longitude 136°25′ W., U.S.N.M. no. 108141.

Description.—Based upon the holotype, the only specimen known. Dorsal rays III–12, anal rays I–9; pectoral rays 13, pelvic rays I–7; caudal rays III–19–III; scales in a lateral series 25; gill rakers on the anterior arch 9 above, 22 below. Proportions of the length without caudal are: Length of head 2.7; snout to dorsal origin 2.0; snout to insertion of pectorals 2.6; snout to insertion of ventrals 2.5; snout to anal origin 1.6; greatest depth of body 3.4; length of pectoral fin 3.1; length of ventral fin 5.2; length of caudal peduncle 3.5; base of dorsal fin 3.9; base of anal fin 7.2. Proportions of the length of the head: Diameter of eye 5.8; interorbital width 2.1; length of snout 3.5; length of maxillary 2.3; length of pectoral fin 0.9; length of ventral fin 1.9; greatest depth of body 1.3. The caudal peduncle is 2.7 times as long as the least depth. The maxillary extends to the posterior border of orbit. The pectoral origin lies a little in front of the insertion of the ventrals. The anal originates under the ninth dorsal ray. There are scales on the operculum. The preopercular margin is vertical. The head is rough and cavernous. A high thin ridge with many small spines runs on either side of the top of the head from the nape to a perpendicular through the anterior margin of the orbit; a similar nearly horizontal ridge over the eye extends a distance equal to the diameter of the eye anterior to the orbit; a third slightly oblique ridge of the same length runs under the eye; and a fourth, less prominent, ridge behind the eye joins the posterior ends of the supra- and infraorbital ridges. A rostral spine is present (2.9 mm long). The long gill rakers (longest 7 mm) are toothed on their inner margins. Pseudobranchiae are present. The dentition is very weak. There are

no teeth on the tongue or maxillary and only tiny patches on the vomer and palatine. The dentaries and premaxillaries each bear a thin band of villiform teeth. The origin of the dorsal fin is a little closer to the snout than to the base of the middle caudal rays. The distance from the origin of the anal to the snout is contained 1.5 times in the distance from the origin to the base of the middle caudal rays.

Remarks.—This species is related to that group of species of the genus that have more than 20 scales in a lateral series and also have a distinct rostral spine. This group contains *M. megalops*, *M. macro-*

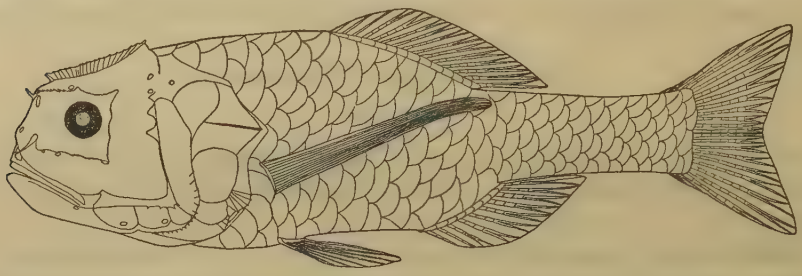

FIGURE 69.—*Melamphaes rugosus*, new species: Holotype (U.S.N.M. no. 108141), 94 mm long, from station 453D.T.

cephalus, *M. cristiceps*, *M. crassiceps*, *M. atlanticus*, *M. nigrofulvus*, *M. unicornis*, and *M. triceratops*. From *M. megalops* [3] it is distinguished by the deeper caudal peduncle (2.4 as long as deep in *M. rugosus*, 4.0 to 4.5 in *M. megalops*); larger eye (5.8 in head in *M. rugosus*, 3.5 to 3.75 in *M. megalops*); and the more posterior insertion of the ventrals (behind the pectoral base in *M. rugosus*, ahead of the base in *M. megalops*).

It is separated from *M. macrocephalus* [2] by the larger eye (5.8 in head for *M. rugosus*, 8.5 to 9.4 for *M. macrocephalus*); wider interorbital space (2.1 in head in *M. rugosus*, 2.66 to 3.0 in *M. macrocephalus*); and the more posterior insertion of the pelvics.

From *M. cristiceps* [3] it is distinguished by the larger eye (5.8 in head in *M. rugosus*, 7.0 to 8.5 in *M. cristiceps*); the wider interorbital space (2.1 in head in *M. rugosus*, 3.25 to 3.5 in *M. cristiceps*); and by the smaller pectoral fin (13 rays in *M. rugosus*, 14 to 15 in *M cristiceps*).

From *M. crassiceps* [3] *M. rugosus* is distinguished by the size of the eye (5.8 in head in the latter, 7.0 to 8.5 in the former); and by the wider interorbital space (2.1 in *M. rugosus*, 3.25 to 3.5 in *M. crassiceps*).

It can be told from *M. atlanticus*,[3] to which it seems most closely related, by the deeper body (3.4 in length without caudal in *M. rugo-*

[2] Measurements taken from Parr, 1931.
[3] Measurements from Norman, 1929.

sus, 3.8 to 4 in *M. atlanticus*); wider interorbital (2.1 in head in *M. rugosus*, 3.25 in *M. atlanticus*); smaller pectoral fin (13 rays in *M. rugosus*, 15 in *M. atlanticus*).

M. rugosus can be differentiated from *M. nigrofulvus* [3] by the shorter head (2.7 in length without caudal in *M. rugosus*, 2.25 to 2.5 in *M. nigrofulvus*); more anterior insertion of dorsal (snout to dorsal origin less than from dorsal origin to base of caudal in *M. rugosus*, greater in *M. nigrofulvus*); more anterior insertion of anal fin (distance from snout to anal origin less than from origin to base of anal in *M. rugosus*, greater in *M. nigrofulvus*).

From *M. unicornis* [3] it can be separated by the wider interorbital space (2.1 in head in *M. rugosus*, 4.66 in *M. unicornis*); and larger eye (5.8 in head in *M. rugosus*, about 7.0 in *M. unicornis*). Finally, it differs from *M. triceratops* by the lack of the prominently projecting horizontal spine anteriorly, characteristic of that species, and the longer dorsal (III, 12 in *M. rugosus*, III, 10–11 in *M. triceratops*).

The portion of the key referred to above, which includes these species, should be modified as follows to include this species:

B. A spine on the middle of the snout between the nostrils or anterior parts of eyes; origin of anal below posterior half of dorsal.
1. Origin of pelvic a little in front of pectoral base; caudal peduncle 4 to 4½ times as long as deep; diameter of eye 3½ to 3¾ in head ..... **M. megalops**
2. Origin of pelvic slightly in front of pectoral base; caudal peduncle 2 to 2½ times as long as deep; diameter of eye 8½ to 9½ in head; head 2 to 2⅓ in length without caudal ..... **M. macrocephalus**
3. Origin of pelvic below or a little behind pectoral base; caudal peduncle 2¼ to 3 times as long as deep.
a. Dorsal III, 12–15; origin nearer end of snout than base of caudal; interorbital width 2 to 3½ in head.
x. Diameter of eye 7 to 8½ in head; maxillary extending to a little beyond the posterior margin of the eye; head 2½ to 2⅔ in length without caudal.
o. Head 2⅔ to 2⅔ in the length without caudal; last ray of dorsal behind vertical from middle of anal fin base; caudal peduncle 2½ to 2⅔ as long as deep ..... **M. cristiceps**
oo. Head nearly 3 in the length; last ray of dorsal a little in front of vertical from middle of anal; caudal peduncle nearly 3 times as long as deep ..... **M. crassiceps**
xx. Diameter of eye 5⅔ to 6⅓ in head; maxillary extending to below posterior ¼ of eye; head 2⅞ to 3 in length without caudal; caudal peduncle 2⅔ to 3 times as long as deep.
p. Interorbital 2⅒ in head; pectoral with 13 rays ..... **M. rugosus**
pp. Interorbital 3¼ in head; pectoral with 15 rays ..... **M. atlanticus**
b. Dorsal III, 10–12; origin a little nearer base of caudal than end of snout; caudal peduncle 2⅓ to 2½ times as long as deep; head 2¼ to 2½ in length without caudal.
x. Interorbital width about 3 or less; eye 6 in head ..... **M. nigrofulvus**

[3] Measurements from Norman, 1929.

xx. Interorbital width about 4⅔; eye 7 in head ..... **M. unicornis**

c. Dorsal III, 10–11; origin nearer end of snout than base of caudal; frontal crests each with a prominently projecting horizontal spine anteriorly; caudal peduncle about 2⅓ times as long as deep; head 2¼ to 2⅔ in length without caudal ..... **M. triceratops**

Named in reference to the rough and spinous nature of the head.

Order PEDICULATA

Family ONEIRODIDAE

Genus ONEIRODES Lütken, 1871

ONEIRODES BULBOSUS, new species

FIGURE 70

Holotype.—A specimen 57 mm in length without caudal, from station 1109C, taken March 11, 1934, latitude 53°50′ N., longitude 133°54′ W. (about 25 miles WSW. of Frederick Island, one of the Queen Charlotte Islands), U.S.N.M. no. 108149.

Description.—The body and all it appendages, except the bulb of the illicium, are jet black. The form is deep, wide, and nearly bulb-shaped. The greatest depth (at a vertical from in front of the isolated dorsal ray) is equal to the breadth of the fish between the downward projecting spines at the posteroventral corner of the opercular apparatus. The sphenotic spines are well developed. They project from the surface of the head to a height a little greater than the diameter of the tiny eye. They arise at a vertical well behind the eye. The cheek is a large roughly triangular concavity formed by a ridge running from this spine down along the preoperculum and the upper jaw. A little above the center of this concavity the tiny eye projects from the skin to a height equal to its diameter. Between the two sphenotic spines there is a large, deep concavity that extends from behind the level of those spines to the basal bone of the illicium. At the level of the sphenotic spines this cavity is 7 mm wide and 5 mm deep (8.1 and 11.4 in the length without caudal respectively). The bottom of the cavity is a dark brown, distinctly lighter than the rest of the body. The walls of the cavity are formed by the frontal bones. The upper and lower jaws are both heavy. The former extends back to a vertical between the eye and the sphenotic spine; the latter projects slightly and is provided with a rounded mental knob. Posterior to the corner of the mouth, and below its level, there is a sharp stout spine of about the same size and shape as the sphenotic spine, which projects outward and downward at an angle of about 80° with the head. Below this there is a broad, heavy, flat, triangular spine, which projects downward at the posteroventral corner of the opercular apparatus nearly to the ventral outline.

In the lower jaw there are 11 teeth on the left side, 10 on the right. These teeth are unequal in size and irregularly spaced in a single row. They are long and slender, are depressible, and slant inwardly. There are 12 teeth in each upper jaw, similar to those in the lower jaw but not so long or strong. There is a bare space 8 mm wide at the junction of the premaxillaries. There are 2 teeth on the right side of the vomer and 3 on the left.

The illicium is 17 mm long, the basal bone 7 mm (3.4 and 8.1, respectively, in the length without caudal). The basal bone projects slightly beyond the snout. The bulb of the illicium bears 4 projections

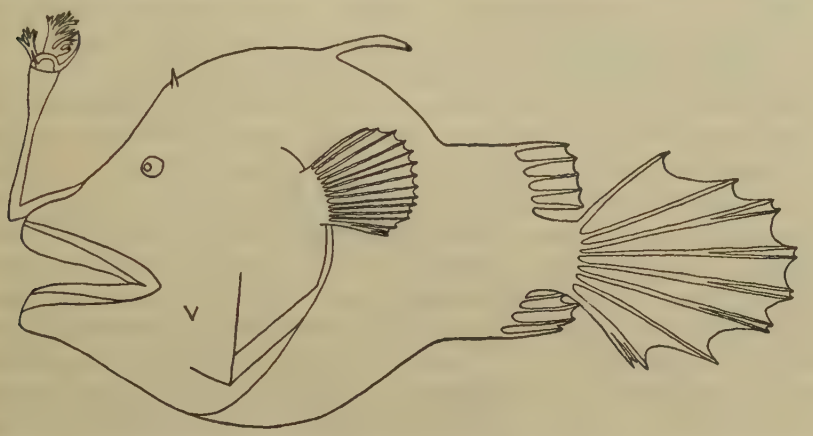

FIGURE 70.—*Oneirodes bulbosus*, new species: Holotype (U.S.N.M. no. 108149), 57 mm long, from station 1109C.

arranged in an anteroposterior line across its top. The first one anteriorly is a short tentacle from whose end branch several bifid or trifid secondary tentacles. The next two are arranged bisymmetrically on either side of the midline behind the one just mentioned. They each branch and rebranch several times to form a large clump of moderately long secondary tentacles. Behind these and past the center of the midline is a small round projection which bears no tentacles. Lastly there arises just above the edge of the pigment line posteriorly a long slender tentacle that bears no secondary tentacles but is curved anteriorly so that its end lies in the above mentioned double clump of tentacles. There is no pigment on the bulb or tentacles. Between the posterior two projections on the bulb there is a small pore.

The isolated dorsal ray is located at a vertical from the base of the pectoral. It is fleshy and lax and is 9 mm long. The soft dorsal consists of 5 rays, none of which is bifid. It is inserted far back on the body, at the same vertical as the anal, and its base slopes sharply down to the short caudal peduncle behind. The caudal contains 8 rays.

Its formula is 2–4–1–1; that is, the two dorsal rays are simple, the next four bifid, the next one simple, and the ventralmost bifid. The anal has 4 rays, none of which is bifid. Its base is considerably shorter than that of the dorsal. The pectorals contain 13 rays, the ventral one of which is bifid. The ventral ray on the left fin is trifid, with one division deeper than the other so that there at first appear to be 14 rays in this fin. Directly behind and below this fin is the gill opening, which is 6 mm high. The vent is a short distance ahead of the origin of the anal.

Remarks.—Regan (1926, pp. 26, 27) has limited the genus *Oneirodes* to those members of the family Oneirodidae having the premaxillaries not particularly protracted, the illicium near the end of the snout, followed by an isolated simple ray that appears on the middle of the back. To this genus, then, he leaves *Oneirodes eschrichtii*, noting that *O. niger* Brauer and *O. cornutus* Gilchrist probably are species of the genus *Dolopichthys*. *Oneirodes bulbosus* differs from *O. eschrichtii* in having 13 instead of 17 pectoral rays, 5 dorsal rays instead of 6. From the picture of the latter species given by Regan (1926, p. 26) the new species differs in having the sphenotic spine posterior to the eye, the maxillary not extending posteriorly to a vertical from the sphenotic spine, the basal bone of the illicium projecting past the snout, in having the above mentioned spine below and behind the corner of the mouth, and in several other characters such as the gill opening extending down only a small distance from the base of the pectoral. The structure and the position of the appendages of the illicium are quite different from those shown for *O. eschrichtii*.

It is believed that this is the first example of the genus *Oneirodes* taken in the Pacific Ocean. Besides *Dolopichthys thompsoni* Schultz, which likewise was taken by the International Fisheries Commission (Schultz, 1934), this species is the only member of the suborder Ceratoidea that has been taken from the northeastern Pacific Ocean.

Named in reference to the nearly spherical shape of the body of the fish.

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